

REMARKS

Prior to the present response, claims 1-7 and 9-20 were pending. By way of the above amendments, claim 17 has been canceled without prejudice or disclaimer and claims 1, 5, 10, 12, 15, and 19 have been amended. Claims 2, 18 and 20 have been rewritten to include the features of their respective parent claims. Accordingly, claims 1-7, 9-16 and 18-20 are currently pending.

In the most recent Office Action, claims 1 and 2 were rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by U. S. Patent No. 6,438,266 to *Bajaj et al.* (hereinafter, "the *Bajaj* patent"). This rejection is respectfully traversed.

Insofar as the rejection may be considered to apply to amended claims 1 and 2, it is respectfully submitted that the *Bajaj* patent fails to identically disclose the novel combinations of each and every feature set forth in these claims.

With respect to amended independent claim 1, the first two recited steps include "dividing a 3-D mesh into a plurality of mesh components, wherein each of the mesh components correspond to a different partition of the 3-D mesh" and "coding each of the plurality of mesh components, wherein the plurality of coded mesh components are capable of being decoded and incrementally reproduced as unit mesh parts of the 3-D mesh." For example, as disclosed in Applicant's specification, at page 3, partial reconstruction becomes possible by reconstructing a 3-D mesh model into a plurality of mesh components (MCOMs) so that it can be processed in units of parts. The general concept of dividing a 3-D mesh into a plurality of MCOMs is shown in Applicant's Figs. 9 and 10, where the 3-D mesh object layer of Fig. 9 is partitioned into the three units of mesh components MCOM0 through MCOM2 shown in Fig. 10. Because each MCOM is coded such that they are capable of being decoded and reproduced in an incremental fashion, division by components becomes possible in a compressed bit stream. Hence, a decoding portion of a codec can reproduce and render each mesh component as soon as decoding of the mesh component is completed. (See Applicants' specification, page 44.)

In the context of claim 1, Applicants respectfully submit that the *Bajaj* patent does not disclose a method of progressive 3-D mesh information coding in which a plurality of

mesh components are coded such that they are capable of being decoded and incrementally reproduced as unit mesh parts of the 3-D mesh. Rather, when the *Bajaj* patent describes “progressive,” it is either in the context of “progressive bit transmission” or “progressive connectivity transmission” (see the *Bajaj* patent, column 10, lines 62-65), both of which pertain to a *multi-resolution* reproduction of a 3-D mesh. For instance, in one technique described in columns 10 to 11 of the *Bajaj* patent, all the connectivity data is encoded at a first stage and not updated any further, while the geometry data is configured to be transmitted to provide progressive *resolution*. This is accomplished by first representing the mesh in a coarse mesh level by transmitting the most significant bit, and then more mesh detail is provided by transmitting the bits of lower significance. The *Bajaj* patent also discloses a technique of progressive connectivity transmission which is used to first simplify a mesh to produce a coarse level mesh along with data pertaining to the details of the original mesh lost in the simplification process. The coarse mesh is first transmitted, restored, and then refined by the details that are transmitted later. In particular, the *Bajaj* patent discloses alternately performing “intra-layer decomposition” and “inter-layer decomposition.” As described in columns 12-13 of the *Bajaj* patent, intra-layer connectivity decomposition is a mesh simplification technique in which half of the vertices in each vertex layer are decimated (i.e., every other vertex in a vertex layer is removed). In an inter-layer simplification stage, mesh simplification is performed by the elimination of a whole vertex layer and re-triangulation of the space between contours which were adjacent to the decimated vertex layer. The details formed with each inter-layer and intra-layer simplification are transmitted after the coarse layer mesh is transmitted. (See the *Bajaj* patent, columns 9-13, and the abstract.). It is respectfully submitted that the concept of progressive *resolution*, as disclosed in the *Bajaj* patent, is not the same as progressive coding as set forth in claim 1.

The next step recited in claim 1 is that of “multiplexing the plurality of coded mesh components into a compressed bit stream and transmitting the compressed bit stream.” In connection with this claimed subject matter, the Office Action refers to the “Alternatively Combine Encoding” box of Fig. 10 in the *Bajaj* patent. (See the Office Action, page 2, lines 23-24.) Fig. 10 of *Bajaj* shows the sequence of process steps from the capture of a

vertex mesh of 3-D video images, including the separate encoding of “generalized” and “exceptional” triangle strips, and alternately applying the separate encodings in creating a transmitted signal. (See the *Bajaj* patent, column 9, lines 4-9.) However, Fig. 10 does not disclose the concept of “progressive 3-D mesh information coding” as set forth in claim 1.

Independent claim 2 recites a steps of dividing a 3-D mesh into a plurality of mesh components, wherein each of the mesh components corresponds to a different partition of the 3-D mesh; coding each of the plurality of mesh components; and multiplexing the plurality of coded mesh components into a compressed bit stream and transmitting the compressed bit stream, wherein each of the plurality of mesh components includes at least connectivity information, geometry information and photometry information which are necessary to reconstruct the coded mesh components themselves. In connection with this subject matter, the Office Action alleges that the *Bajaj* patent “discloses the claimed ‘connectivity and geometry information.....’ (i.e., fig. 31, abstract lines 4-5).” (See the Office Action, page 3, lines 1-2.) Applicants have reviewed Fig. 31, and the description thereof at column 14 of the *Bajaj* patent relied on in the Office Action for meeting the recitations of claim 2 and respectfully submit that its disclosure of 3-D models having symmetric or repeated components, such as trees, which are transformed and mirrored does not meet the recitations of claim 2. Furthermore, the abstract, lines 4-5 of the *Bajaj* patent: “combination of compressing and encoding of both the topology (connectivity) and geometry (vertex coordinates),” also does not disclose the specific features recited in claim 2.

For at least these reasons, applicants submit that claims 1 and 2 recite novel subject matter not found in the *Bajaj* patent. As such the *Bajaj* patent fails to anticipate these claims.

Claims 3-7 and 9-20 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over the *Bajaj* patent. As noted above, independent claims 5, 10, 12, 15, and 19 have been amended. Insofar that the Office may consider this rejection to apply to the

amended claims, and the claims depending therefrom, Applicants respectfully traverse this rejection.

The rejection of claim 17 has been rendered moot by the cancellation of this claim without prejudice or disclaimer.

Independent claim 5 has been amended to recite that a progressive decoding method includes a step of dividing a transmitted bit stream into a plurality of coded mesh components, wherein the plurality of mesh components are capable of being incrementally reproduced as unit mesh parts of a 3-D mesh. As pointed out above, "progressive," as disclosed in the *Bajaj* patent, is not directed to progressive incremental reproduction of unit mesh parts. Rather, the *Bajaj* patent discloses progressive bit transmission or progressive connectivity transmission, both of which pertain to *multi-resolution* reproduction of a 3-D mesh. For at least the above reasons, claim 5, and hence the claims depending therefrom, is believed to recite novel and inventive subject matter, and thus is patentably distinguished from the *Bajaj* patent.

As to independent claim 12, the Office Action asserts that this claim recites "extracting mesh object layers." This statement is not clear to the undersigned because claim 12 does not explicitly recite this feature. In any event, claim 12 recites a progressive 3-D mesh information coding apparatus that includes, *inter alia*, a multiplexer for multiplexing the plurality of coded mesh components into a compressed bit stream, wherein the plurality of coded mesh components are capable of being decoded and incrementally reproduced as unit mesh parts of the 3-D mesh. For at least the reasons given above for claim 1, these features are not taught, nor are they suggested, in Fig 1 and Fig. 10, nor anywhere else in the *Bajaj* patent.

The features of progressive decoding mentioned above are also brought out in claim 15, which recites a progressive 3-D mesh information decoding apparatus that includes, *inter alia*, a plurality of component decoders for decoding the plurality of coded mesh components, wherein the plurality of decoded mesh components are capable of being incrementally reproduced as unit mesh parts of a 3-D mesh. For at least the reasons given above for claims 1 and 5, claim 15 is believed patentable over the *Bajaj* patent.

Claim 10 is directed to a progressive 3-D mesh information coding/decoding method comprising, *inter alia*, a step of independently coding and transmitting the plurality of mesh components for each of the one or more mesh object layers, wherein each of the plurality of coded mesh components include information necessary such that, when decoded, is capable of being reproduced as a unit mesh part of the 3-D mesh. Contrary to the Examiner's allegations on page 3 of the Office Action, none of Fig. 1 and Fig. 3(a)-3(c) of the *Bajaj* patent disclose or suggest these features. Hence, no *prima facie* case of obviousness exists. As such, the rejection is improper and should be withdrawn.

With respect to 9, this claim recites a progressive 3-D mesh information coding/decoding method that includes, *inter alia*, a step of reconstructing an original 3-D mesh by collecting independent mesh object layers and removing redundant information. The Examiner asserts that "removing redundant information would have been obvious to one of ordinary skill in the art since removing the redundant information is one of the means primarily used for compressing data." The undersigned does not understand the logic of this statement because the claimed feature pertains to a decoding step, and thus decompression processes. Moreover, Applicants dispute any allegation that it would have been obvious to transmit an independently coded mesh object layer and remove redundant information in a decoding process, as evidenced from the Examiner's own statement regarding the removal of redundant data before compressing data. If the Examiner intends to maintain this rejection, it is respectfully requested that he provide a reference teaching the claimed combination including this feature. Each of independent claims 18 and 20 similarly recite combinations features that include, *inter alia*, removing redundant information after a decoding step. Hence, at least for the reasons given above for claim 9, each of claims 18 and 20 are believed patentable.

Amended independent claim 19 recites a progressive 3-D mesh information coding/decoding apparatus that includes, *inter alia*, a plurality of mesh component coders for independently coding and transmitting the plurality of independent mesh components, wherein each of the plurality of coded mesh components include information necessary such that, when decoded, is capable of being rendered as a unit mesh part of the 3-D mesh. As pointed out above for claim 1, the *Bajaj* patent does not teach or suggest a plurality of mesh

component coders for encoding mesh components such that they are capable of being rendered in unit parts of 3-D mesh. The 3-D "image" shown in Fig. 1 is the same as the object 10. Nor do Figs. 3(a)-3(c) or Fig. 10 teach or suggest the kind of *rendering* as recited in claim 19. The Examiner also relies on Figure 32 of the *Bajaj* patent for allegedly teaching "one or more mesh object layer coders" It is not clear why Fig. 32 was cited in the Office Action. Fig. 32 shows a chart pertaining to an object code that includes mirror descriptions. It is respectfully requested that the Examiner explain this portion of the rejection further. Applicants nevertheless submit that none of the cited figures and the abstract of the *Bajaj* patent teaches or suggests rendering as a unit of mesh parts in the context in which this feature is recited in claim 19. Hence, claim 19 is patentable.

Claims 3, 4, 6, 7, 11, 13, 14 and 16 depend from one of independent claims 1, 5, 10, 12 and 15 and recite additional features. It is respectfully submitted that claims 1, 5, 10, 12 and 15 would not have been obvious within the meaning of 35 U.S.C. § 103 over *Bajaj* at least for the reasons as set forth above. Therefore, it is respectfully requested that the Examiner withdraw the rejection of these claims.

For at least the foregoing reasons, Applicants respectfully submit that the present patent application is in condition for allowance. An early indication of the allowability of the present patent application is therefore respectfully solicited.

Respectfully submitted,

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